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DESIGN OF TRAFFIC AMERCEMENT AUTOMATION USING COMPUTER VISION

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Abstract: ***Traffic rule violations, such as speeding, not wearing a proper protective helmet, and running red lights, are a major contributor to the high number of road accidents in India. According to National Crime Records Bureau data, over 1.5 lakh people lose their lives in road accidents across the country every year, an average of 426 daily or 18 every hour. To address this issue, we propose an automated system for collecting traffic fines using machine learning techniques. The system utilizes object detection to identify vehicles that have violated traffic rules, using video surveillance cameras. It then extracts the number plate and an encrypted QR code of the vehicle, which can be used to retrieve the vehicle owner's phone number and other details. These details are stored on a server, and the system sends three reminders for payment within a fixed time window. If the fine is not paid, the vehicle's registration with the RTO (Regional Transport Office) is automatically cancelled and it is no longer allowed on the road. This system aims to improve the efficiency and accuracy of the traffic fine collection process, while also reducing errors and the possibility of bribery. The use of machine learning techniques and video surveillance cameras allows for continuous monitoring of traffic, reducing the need for large numbers of traffic police to manually monitor the roads. The extraction of the QR code and vehicle owner's details also makes it easier to track and verify transactions, ensuring that the correct fine is being paid by the right individual. The automatic cancellation of the vehicle's registration if the fine is not paid serves as a deterrent for individuals attempting to evade paying their fines. In summary, our proposed system utilizes advanced technology to automate the traffic fine collection process, improving efficiency and accuracy while also reducing the possibility of bribery and errors.y.***

I. INTRODUCTION

There has been a significant increase in the number of vehicles on the roads in recent years, with many places experiencing more vehicles than people. This increase in traffic has led to people breaking traffic rules in an effort to reach their destinations on time. In some countries, the lack of proper road lane systems can also contribute to accidents, particularly when heavy vehicles are near smaller two-wheelers. Two-wheelers are particularly prone to accidents due to their vulnerability on the roads, and the lack of helmet usage is a major contributor to fatalities in this category. Traffic-related fatalities, particularly those involving two-wheelers, have risen significantly in the past decade. Most countries have dedicated traffic police forces, but these systems are often overwhelmed by the sheer volume of traffic and can be inefficient in preventing accidents.

Developing countries like India is majorly equipped with humanized traffic system. Such system can sometimes be a blessing and sometime it can be a curse. Here blessing comes with the fact that such system is less prone to human error but not totally. Curse of such system is one of the main reason it should be avoided. Curse involve any miscommunication, misdirection and our major topic of discussion Bribery. People in such system can easily get away with their crime which involve over-speeding, not wearing helmet etc by simply bribing the traffic police. Such system doesn't bring any justice to the society as such action only increases the traffic violation rate.

Computer equipped traffic system can easily out perform a humanized system. Here everything can be automated by simply eliminating the need of any middle-men. Such system can efficiently implement the traffic rules. It can check whether someone is violating the traffic rules of not , if someone is violating then a proper fine is imposed on him/her .

II. LITERATURE SURVEY

In [1] A S Mohammed research they simply describe the process here involves several steps to extract the license plate number from an input image using image processing techniques. The first step is to convert the input image from RGB to grayscale format. The bilateral filter is then applied to remove background noise while preserving edges. Canny edge detection is used to detect the edges of the license plate. All contours in the processed image are detected, and the top 30 contours are selected for further processing. These contours are checked for rectangular shape, and if found to be a rectangle, they are considered to be the license plate and the image is cropped accordingly. The cropped image is then passed through a text recognition tool such as Tesseract , which extracts the string of the license plate number and displays it on the terminal. This process allows for the accurate and efficient extraction of license plate numbers

from images, enabling the automation of traffic rule violation detection and fine issuance.

In a research study conducted by Y Mohona Roopa [2], the primary goal was to fully automate the process of detecting helmet usage and issuing fines. Previously, traffic surveillance was largely semi-automated or completely reliant on human input. However, the new system being proposed aims to detect vehicles without helmets using CCTV footage and extract the license plate. The number is then searched in a database to obtain the registered phone number. The image of the footage, along with details of the fine and payment options, is mailed and sent via message to the registered phone number. The information is also updated online for future reference. This automated process allows for efficient and accurate enforcement of helmet usage regulations and promotes compliance with traffic rules..

Here in our proposed system we can use the model to detect the number plate of the vehicle along with the qr code attach to it. The Qr code will be initially encrypted, we can decrypt it to get the required information and then easily sent the payment details to the corresponding vehicle owner.

In [3] the proposed system is an android-based solution for automating the process of detecting and enforcing traffic rule violations. It aims to address the challenges associated with manual traffic rule enforcement by utilizing QR code technology and online payment methods.

In this system, a QR reader is used to scan the QR code attached to each vehicle. This code, which is mandatory for all vehicles, is obtained when the vehicle is purchased or when the driver receives their license from the Road Transport Office (RTO). When a violation is detected, the system extracts the QR code from the footage and uses it to search for the registered phone number in a database. An image of the footage, along with details of the violation and a payment request, is then sent to the registered phone number via SMS or UPI app. The fine is automatically collected from the owner's bank account, and the information is updated online for future reference.

This android-based system provides a convenient and efficient way to enforce traffic rules and collect fines. By automating the process, it helps to reduce the workload of traffic police and promotes compliance with traffic regulations. It also helps to reduce the number of accidents and fatalities on the roads by encouraging responsible driving behavior.In this system, a QR reader is used to scan the QR code attached to each vehicle. This code, which is mandatory for all vehicles, is obtained when the vehicle is purchased or when the driver receives their license from the Road Transport Office (RTO). When a violation is detected, the system extracts the QR code from the footage and uses it to search for the registered phone number in a database. An image of the footage, along with details of the violation and a payment request, is then sent to the registered phone number via SMS or UPI app. The fine is automatically collected from the owner's bank account, and the information is updated online for future reference.

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In [4] The program for generating QR codes is implemented using the JavaScript language and run on a node.js server. The generated QR code is displayed on a web browser for the user to view and scan. In order to add an additional layer of security, the QR code is encrypted using Elliptical Curve Cryptography (ECC).

To scan or read the encrypted QR code, the user needs to install a QR code scanner app on their smartphone. There are many such apps available for free on app stores. Once the app is installed, the user can start the application and use the smartphone camera to scan the QR code. The app will automatically display the content of the QR code once it has been scanned.

This system provides a convenient and secure way for users to access information encoded in QR codes. The encryption ensures that the information cannot be accessed by unauthorized parties, while the QR code scanner app allows for easy and quick access to the information by the intended user.

In[5],First, a selection of QR code images were chosen and the mobile phone QR code reading software was used to try and read the information contained within them. The statistical recognition rate of the QR code images that could not be read by the software was then analyzed.

Next, the processed QR code images were read using the mobile phone QR code reading software, and the statistical recognition rate was analyzed. The results showed that the QR code reading rate after processing by the system algorithm in this article increased by 14%. This demonstrates the effectiveness of the algorithm in improving the recognition rate of QR code images.

However, it should be noted that the processed images were not recognized by the existing reading software, indicating that further research is needed to explore the security and application aspects of the algorithm in other areas. In the future, image enhancement and robustness issues may also be analyzed in more detail to further improve the performance of the QR code reading algorithm.

III. PROPOSED METHODOLOGY

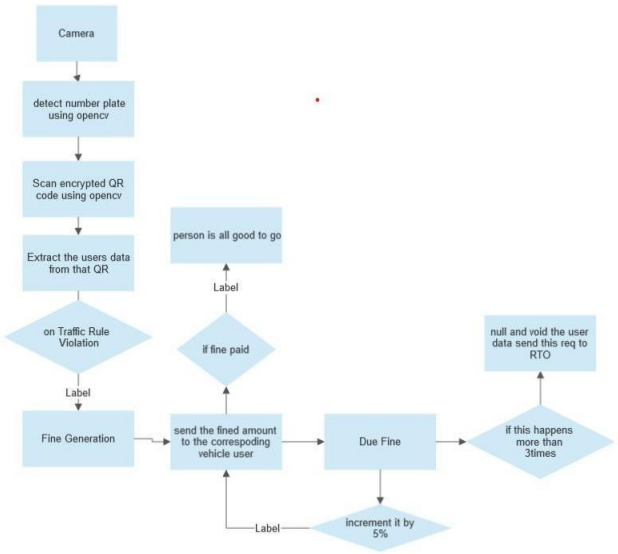

Fig1: flow diagram of proposed methodology

The proposed system aims to fully automate the process of detecting traffic rule violations and issuing fines using CCTV cameras as shown in fig 1. When a violation is detected, the system extracts the vehicle's license plate or QR code from the footage and searches for the associated phone number in a database. The system then sends an image of the footage, along with details of the violation and a UPI payment request, to the registered phone number. The information is also updated online for future reference. The automated process involves several stages, including the detection of the violation, identification of the vehicle, and issuance of the fine..

A. Violation Recognition

The YOLOv3 object detection framework is used to detect traffic violations such as helmet usage and over speeding. This neural network-based system analyzes images at test time to detect the presence of objects. In the proposed system, videos from traffic surveillance are processed using YOLOv3. This framework is particularly useful for detecting a wide range of objects, including two-wheelers, and is known for its speed and accuracy. In this system, YOLOv3 is trained to identify instances of two-wheeler vehicles that are not wearing helmets or are speeding.

B. Training over model

To train a custom helmet or identification model, a large number of images showing helmets usage in various situations will be needed. The more images that are used for training, the more precise the model will be. It is likely that several thousand images will be required to achieve sufficient accuracy. It is important to ensure that the images used for training represent a diverse range of situations, including different lighting conditions, angles, and environments, in order to improve the model's generalizability. By increasing the number of images used for training, it is possible to further improve the model's accuracy

C. Implementation through opencv

OpenCV is a tool for image processing that can be used to identify objects. In this system, the OpenCV library is used to differentiate the trained object (e.g. helmet) from other objects. This library supports three programming languages: Java, Python, and C++. By using OpenCV, it is possible to differentiate and detect helmets usage in images. The library's various functions and algorithms can be used to analyze and extract information from images, enabling the identification of specific objects or patterns.

D. Frames Collection

OpenCV is a tool for image processing that can be used to identify objects. In this system, the OpenCV library is used to differentiate the trained object (e.g. helmet) from other objects. This library supports three programming languages: Java, Python, and C++. By using OpenCV, it is possible to differentiate and detect helmets usage in images. The library's various functions and algorithms can be used to analyze and extract information from images, enabling the identification of specific objects or patterns.

E. Number Plate Extraction

The process of extracting number plates from images or video frames uses an automatic number plate recognition (ANPR) module. This module utilizes an API from Plate Recognizer to analyze the images and identify the number plates. The locator module sends a request for the image or video frame being processed to the ANPR module, and receives a JSON response. The field containing the vehicle's number plate in the frame is then extracted using standard Python techniques. The ANPR module is able to accurately and efficiently identify and extract number plates from a wide range of images and video frames, making it a useful tool for automated traffic rule violation detection systems.

F. QR Code Extraction

In the proposed system, the QR code associated with a vehicle is scanned and decrypted to extract the registered mobile number. Once the mobile number has beenobtained, a fine is generated in the database for the corresponding traffic rule violation. The number plate and the final frame, along with details of the fine, are updated on the server. A message containing a UPI payment request is then sent to the registered phone number via SMS gateway or UPI app. This automated process allows for efficient and convenient payment of fines, and helps to ensure that traffic rule violations are effectively enforced.

G. Fine Generation

The proposed system is able to generate fines for traffic rule violations by detecting the vehicle's number plate or

by scanning the QR code associated with the vehicle. When a violation is detected, the system extracts the number plate or QR code from the footage and searches for the associated phone number in a database. The fine is then automatically generated and sent to the registered phone number along with details of the violation and a payment request. This automated process allows for efficient and accurate enforcement of traffic rules, and helps to promote compliance with traffic regulations. It also allows for convenient payment of fines through the use of UPI apps or SMS gateway.

IV Conclusion

Automating the process of collecting traffic fines using number plate recognition technology and qr code encryption can have several benefits. One of the main advantages is that it can make the process more efficient and convenient for both the authorities and the individuals who have received the fines. With QR code recognition, authorities can easily identify vehicles that have been involved in traffic violations and automatically send a fine to the owner of the vehicle by extracting data from Encrypted QR code. This can save time and effort for both parties, as the individual does not have to physically visit a payment center to pay their fine.

Another benefit is that automating the fine collection process can help to reduce errors and fraud. By using number plate recognition technology, it is easier to track and verify transactions, ensuring that the correct amount is being paid by the right person. This can help to prevent individuals from trying to evade paying their fines or from being wrongly charged.

Overall, automating the process of collecting traffic fines using number plate recognition and QR code technology can improve the efficiency and accuracy of the process, making it more convenient for both the authorities and individuals. It can also help to reduce errors and fraud, ensuring that the correct amount is being paid by the right person.

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